day 35

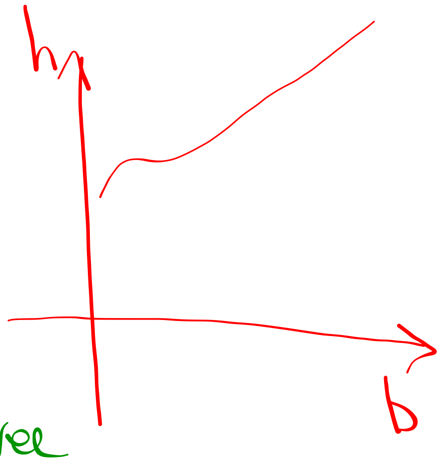
3.6/30 Let b = base diameter (cm)
h = height (m)

$$h = 5.67 + 0.70b + .0067b^2$$

a) graph

b) graph $\frac{dh}{db} = .70 + .0134b$

interpret *



instantaneous rate of change of the height of the tree with respect to the base diameter

or as base diameter increases, the height will changing instaneously by $\frac{dh}{db}$ evaluated at that b.

day 35

3-7/11 $y = e^{5x-7}$

version 1

$y = e^{u}$ $u = 5x-7$

$y' = \frac{dy}{du} \cdot \frac{du}{dx} = e^{u} \cdot (5)$

$= e^{5x-7} \cdot 5$

version 2

$\frac{d}{dx}\left(e^{5x-7}\right) =$

$\frac{d}{dx}\left(e^{x}\right)\Big|_{x = "5x-7"} \cdot \frac{d}{dx}(5x-7)$

$= e^{5x-7} \cdot 5 =$

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day 35

3.7/36) a) $y=(e^x)^3 = e^x \cdot e^x \cdot e^x$

V1

$y = u^3; \ u = e^x$

$y' = 3u^2; \ u' = e^x$

$y' = 3(e^x)^2 \cdot e^x = 3(e^x)^3$

V2 deriv of something cubed is 3(something)^2

$y' = 3(e^x)^2 \cdot \frac{d}{dx}(e^x) = 3(e^x)^2 \cdot e^x = 3(e^x)^3$

Composition $\underbrace{x \xmapsto{e^x} e^x}_{\text{inner}} \underbrace{\xmapsto{x^3} (e^x)^3}_{\text{outer}}$

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day 35

36 b) $y = e^{(x^3)}$

V1

$y = e^u \quad u = x^3$

$y' = e^u \quad u' = 3x^2$

$y' = e^{(x^3)} \cdot 3x^2$

$= 3x^2 e^{(x^3)}$

$x \longmapsto^{x^3} x^3 \longmapsto^{e^x} e^{x^3}$

V2) deriv of e^something is e^something

$y' = e^{(\;\;)} \cdot \frac{d}{dx}(\;\;)$

$= e^{(x^3)} \cdot \frac{d}{dx}(x^3) =$

$3x^2 e^{(x^3)}$

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day 35

3.7/2) Let $h(x)=f(g(x))$, where f & g are DIFFERENTIABLE on their domains.
If $g(1)=3$ and $g'(1)=5$, what else do I need to calculate $h'(1)$?

a) $h'(x)=f'(g(x))\cdot g'(x)$

b) $h'(1)=f'(3)\cdot(5)$

HELP I NEED $f'(3)$!

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day 35

3.6/15) $s(t) = -16t^2 + 64t + 32$

a) $v(t) = -32t + 64$

b) highest point?
A2/PC: find coord of vertex by finding axis of symmetry by finding x-coord of related f°

calc: $v'(t) = 0$
$-32t + 64 = 0 \Rightarrow t = 2$ sec

c) $s(2) = -16(2)^2 + 64(2) + 32 = 96$ ft

d) stone hit ground when $s(t) = 0$
$-16(t^2 - 4t - 2) = 0$

$t = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(-2)}}{2(1)} = \frac{4 \pm \sqrt{24}}{2}$

$\sqrt{24} = \sqrt{2 \cdot 2 \cdot 2 \cdot 3} = \sqrt{2 \cdot 2} \cdot \sqrt{2 \cdot 3} = \sqrt{4} \cdot \sqrt{6} = 2\sqrt{6}$

$\frac{4 - \sqrt{24}}{2} < 0$

$\boxed{\frac{4 + \sqrt{24}}{2}}$

e) $v(2+\sqrt{6}) = -32(2+\sqrt{6}) + 64$
$= -64 - 32\sqrt{6} + 64 = -32\sqrt{6}$ ft/sec

f) sign chart of velocity & acceleration $= -32$

$v(t)$ + + + + | - - - - - -
2
$a(t)$ - - - - - - - - - -

Speed Increasing means sign of velocity & acceleration are SAME

(2, 96)

day 35

HW/ 3.6/20-21, 25-26

3.7/13-15, 23-26, 37, 40, 57-58

3.8/1-6

3.8

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day 35

3.8 Implicit Differention

Suppose I know a relationship between x & y, but can't solve for y

$$x^3y^4 - x^2y + 7 = 0$$

Often I can still find a derivative!

$$\frac{d}{dx}(x^3y^4) - \frac{d}{dx}(x^2y) + \frac{d}{dx}(7) = \frac{d}{dx}(0)$$

$$\frac{d}{dx}(x^3)\cdot y^4 + x^3\frac{d}{dx}(y^4) - \left(\frac{d}{dx}(x^2)\cdot y + x^2\cdot\frac{d}{dx}(y)\right) = 0$$

$$(3x^2)\cdot y^4 + x^3\left(4y^3\frac{dy}{dx}\right) - 2xy + x^2\left(\frac{dy}{dx}\right) = 0$$

$$\frac{d}{dx}(y^4) = 4(y^3)\cdot\frac{d}{dx}y$$

$$4x^3y^3\frac{dy}{dx} - x^2\frac{dy}{dx} = 2xy - 3x^2y^4$$

$$\frac{dy}{dx}\left(4x^3y^3 - x^2\right) = 2xy - 3x^2y^4$$

$$\frac{dy}{dx} = \frac{2xy - 3x^2y}{4x^3y^3 - x^2}$$